Abc method – guarantor of real costs in the mining extractive industry entities

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Abstract: - The article aims to emphasize the importance of the ABC method in the provision of real production costs within mining extractive industry entities in Romania. Starting from the progress of investigations undertaken in the specialty literature regarding the adaptation and implementation of the ABC method to the specifics of the entities in the mining and quarrying industry to the achievements made so far by various specialists, the authors of this article demonstrate the successful implementation of the ABC method in mining entities in Romania and the determination of the real costs. The documentation which was the basis of the study and comparison between applicative traditional method used and the ABC method applied is likely to prove the viability of the organization of the managerial accounting of mining extractive industry entities in Romania in order to increase their performances. The article ends with the conclusions of the authors concerning the enlargement of the successful implementation of the ABC method in mining extractive industry entities in Romania.

Key-words: - Activity-Based Costing, production cost, performances, mining industry, charcoal

1 Introduction

Prioritization of objectives in the limited resources allocation requires analysis of cost-benefit relation in order to take effective decisions based on the information available at any given time. Cost systems used by the entities in the mining extractive industry can be approached either from the traditional perspective, either from the perspective of future costs. Entities within the mining extractive industry in Romania use traditional methods of determining the production cost which have rather more disadvantages than advantages. The costs are very important because they have a direct impact on the budget of each entity. Thus, it becomes very important the aspect of the review of the way in which these systems are dealt with in the mining sector in terms of cost, since a wrong cost approach can have a negative impact on the budget, or an incorrect decision may encourage a management entity with negative long-term consequences. Based on these findings, the question that arises is: are there methods that can lead to cost reduction and providing real information and timely to the entity's management of extractive mining industry to properly ground and take decisions with long-term positive impact?

2 Literature review

The extractive mining industry was studied by many specialists who have tried over the years to adapt various methods of determining the production cost of charcoal. Among these we mention exceptional contributions on the comparison of cost's calculation methods in the area of the underground mining industry (Falconer, 1989; Lind, 1999). In Romania there have been also some great contributions from specialists and teachers of managerial accounting, (Man, 2010; Călin, 2002) whose work formed the basis for the development and implementation of several concepts related to the mining activity.

Both internationally and nationally all these attempts to improve the managerial accounting within the extractive industry entities focused on more directions such as: organization of the study of managerial accounting, application principles specific to the different costs calculation methods such as Target Costing, Standard Cost Accounting, etc., adaptation of chart of accounts to the specifics of the mining industry etc.

3 Research methodology

Starting from the research done and the results achieved by the extraction mining specialists, we proposed to try to adapt the principles of the ABC method to the particular features of this branches in the entities in Romania. Therefore we have tried to find answers to the following questions: *(1) the production cost obtained by ABC method is a relevant and real cost?* (2) *What should be the composition of the production cost according to the specific mining extractive industry entities? (3) The ABC Method is a guarantor of improving cost calculation?* The importance of matters of profitability of charcoal extractive industry entities resulting in particular from the concerns in this regard of different researchers both in Romania and internationally.

2.1 Identification of appropriate criteria for the classification of expenditure and the composition of production cost

We had in mind the identification of appropriate criteria for the classification of expenditure-specific mining industry and the possibility of determining the correct and the real production cost. According to opinion of several experts in the specialty literature (Călin, 2002; Man, 2010; Lind, 1996), the most significant criterion for the classification of expenditure relating to charcoal production which takes into account the specifics of the ABC method is the way in which the cost of products is distributed and consists in their separation into: *direct costs* and *indirect costs*. Direct costs are those costs which are identified on a particular object from the time of their calculation and are included directly in the calculation of the cost object. In this category falls the expenditure on consumption in raw and auxiliary materials, direct materials, and other consumable materials, fuel and energy for technological, wages of miners directly calculated for productive work in production etc. Indirect costs are those costs that are not directly identifiable and cannot be assigned to a given item -therefore cannot be included directly in their cost, but indirectly by allocating on the basis of arbitrary criteria. Considering the sectors and the nature of the activities in the mining sectors, indirect expenses are as follows: administrative staff salaries expenses, operating expenses for depreciation of the fixed assets, repair and maintenance expenses, and costs of postage and telecommunications taxes, banking and similar charges, expenses for the services performed by third parties, the expenses on fuel (petrol for means of transport) expenses for spare parts, expenditure on water, gas, electricity etc., other overheads. Classification of production expenses according to the manner of distribution of the production cost allows the economic entities in the charcoal mining sector a delimitation of expenditure in relation to the cost centers that have reported the respective expenditure, as well as in relation to the cost objects, this underlying the base of calculating the unit cost of production. By applying the principles specific to the ABC method, expenditure are re-classified (table 1) as follows:

Table 1. Reclassification of extractive mining costs of the entity according to the ABC method

Direct expenditure	*Activity expenditures*
Raw materials, explosives, fittings, clamps, braids, arch bricks, sand, ballast, various consumable materials, spare parts, fuel, electricity, water, depreciation, inventory objects, packages, transportation of materials, salaries and accessories wages etc.	Main: charcoal preparing, sterile preparation, maintenance, mining, transport stream extraction front complex mechanized infantry, mounted, unmount the mechanized complex service etc.
	Secondary: flow maintenance service, operation, maintenance, dosing, silo vents (flow comics) sorting, transportation and dumps cablecar station, lamp room, methane-meters, Pyrotechnist, drilling, etc.

3.2 The ABC approach in the mining industry

The general principle of cost allocation per activities and on product typical of the ABC method applied in the mining and extractive industry may be simplified in the following way (fig. 1):

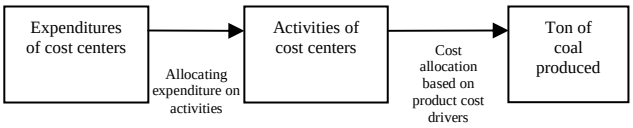

Fig. 1 Cost allocation per activities and products

3.3 Identification of processes and activities

The ABC method involves delimitation of the processes and activities in: main and secondary. According to the research done, we have identified the following processes within the mining extractive industry entity that has been subject to our study: production process and the administrative process. After a very thorough analysis, we have established that the production process includes the main processes (identified per production center) and secondary (identified per sectors of surface activities and underground activities). The following main activities we identified within the main processes as shown in Figure 2. Direct activities may be affected without difficulty at the level of the production cost (cost object). In contrast, secondary activities may, as the case may be, activities to be considered as direct, because it is impossible to identify the customer that will consume or they may be directly allocated to the cost objectives. These affectations are to be found in the study of cost driver's environment representing the links between causation and cost objects. Simplification is the reason of regrouping the activities in activity families. All of these combined activities aimed at subjecting the list of users for whom they are useful. For each activity, certain information number is collected in order to obtain all the needs of the ABC method application. After we have ensured that all objectives have been met and the major issues connected with the establishment, identification and development of activities, we passed to their validation.

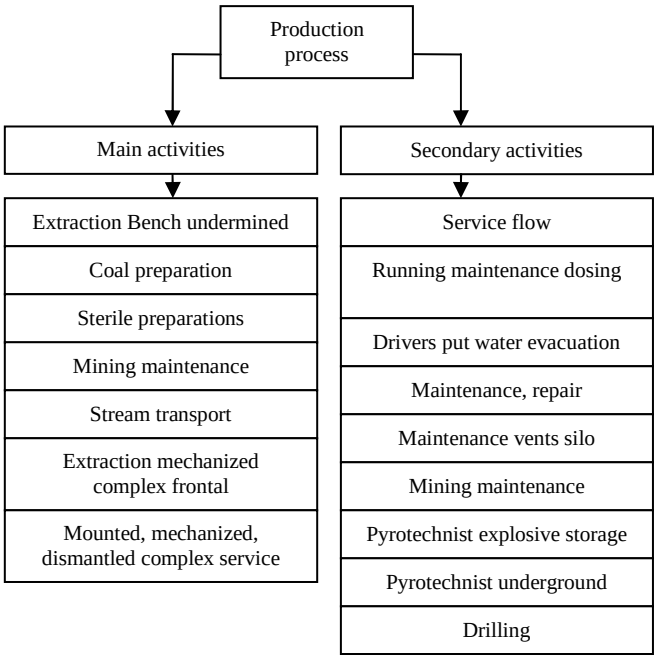

Fig. 2 Main and secondary activities linked to the production process

3.4 Identification of cost drivers

According to the ABC method, the cost drivers [3] means the units of measure used to allocate causal indirect expenses and monitoring of indirect expenses related to activities (production, management, marketing etc.). per objects of costs (supplies, works, services etc.). Therefore, any factor that causes a change in the cost of an activity or measure of the consumed cost of an activity can be called an inducer cost. Cost allocation processes are used to calculate the cost of cost resources that are consumed. They should follow *the principle of cost causality*. The number of cost drivers represents the cause of structural changes in the costs of the activities and the resources expenditure. After studying the main activities in the mining industry we have identified the following list of cost drivers (table 2):

Table 2. List of cost drivers specific to mining extractive entities

Cost drivers
Number of vouchers (kg)
Number of vouchers (litres)
Spare parts number
Total kwh consumed
Number Gcal consumed
The normal duration of use
Repairs carried out number
Third-party invoices number
Consumer litres
Number of hours executed reported the number of salaried

Cost drivers
employees
Number of insurance contracts
Number of bank fees
Postage\tax number
Total fees paid
Number of disabled persons
Number of people travelling, postings
Additional amounts allocated
Additional energy consumption amount
Number of persons employed
Number of protection equipment
Number of trained employees
Health care employees number
Number of employees requiring assistance
Value of telephone subscriptions
Insurance companies safety and protection number

3.4 Determination of production cost

Production cost (PC) expressed in "ton of coal", determined according to the method ABC is:

$$PC = DC + AC \quad (1)$$

Where: DC = direct costs;
AC = activities costs.

After data collection, allocation of expenditure per specific activities and aggregated to cost centers, including cost activities allocation per final product (coal), the production cost obtained (table 3) is as follows:

Table 3. Production cost calculated by ABC method

Explanations			Sum (RON)
Direct costs	Costs on raw materials	01	51624.30
	Costs on explosives	02	64449.00
	Costs on fittings, clamps	03	32970.00
	Costs with braided	04	221764
	Costs on voussoirs	05	3299.67
	Costs on sand ballast	06	562.96
	Costs on consumables	07	10127.00
	Costs on miscellaneous	08	364974.00
	Costs on Fuel	09	11797.07
	Costs on spare parts	10	99710.00
	Costs on electricity	11	110726.00
	Costs on water	12	2639.57
	Depreciation and amortization	13	733000.00
	Costs on inventory items	14	4178.45
	GFR Expenses	15	536200.00
	Packaging costs	16	253.01
	Materials Transport Costs	17	38146.85
	Salaries Costs	18	2290308.00
	Salary expenses enhancements	19	1124838.00
Total direct costs (01+19)		*20*	*5701567.88*
Expenses allocated to activities	Expenditure on miscellaneous	21	3874.00
	Fuel costs	22	3465.00
	Spare parts costs	23	19584.26
	Electricity costs	24	939404.85
	Heating costs	25	29060.00
	Depreciation and amortization	26	76789.24
	Material transport costs	27	405.00
	Machinery repair expenses	28	29491.76
	Expenditure on services provided by third parties	29	551189.88
	Expenses with antidote liquid	30	175.38
	Salaries expenses	31	2185500.00
	Salary enhancements expenses	32	881286.00
	Depreciation of fixed interest	33	154266.38
	Expenditure on insurance premiums	34	986.14
	Expenditure on fees for the issue of copyright	35	7251.50
	Expenses on stamp duty	36	63.00
	Operation Tax	37	136600.00
	Bank commission expenses	38	1208.78
	Costs with maintenance material, building cleaning	39	148.00
	Costs on electricity and motive power	40	5458.00
	Postal expenses	41	708.97
	Travel, secondments and transfers in the country	42	2913.02
	Expenditure on security and civil defense	43	110960.64
	Coal allowances	44	33557.41
	Electricity price difference	45	269933.89
	Meal expenses	46	235507.06
	Protective equipment expenses	47	25306.78
	Personnel training	48	3921.65
	Expenditure on medical health centers	49	27055.97
	Transport costs to and from work	50	73910.97
	Sickness benefit	51	1200.00
	Death support	52	7108.00
Total costs allocated to activities (21+52)		*53*	*5818291.53*
Total production cost (20+53)		*54*	*11519859.41*

The unit cost of the annual production of charcoal is:

$$PC/tone = \frac{11,519,859.41}{44,603} = 258.27 \text{ RON/tone}$$

4 Results

Traditional systems for the determination of costs allocate indirect costs (general) directly to products (in the sense that the product causes costs), then these activities to the units produced. The traditional cost calculation systems refers to the determination of the costs needed to manufacture the products and then to share between them. All costs should be allocated to a single product or to multiple products, which often lead to cross-subsidizing of the costs. Classical systems for determining the costs are using a single cost driver, based on volume. This is the main reason why the classical system of determining costs distorts the costs of products. By making an analogy between production cost obtained by ABC method (table 3) and the production cost obtained by the use of traditional methods of cost calculations (table 4) it can be seen that the production cost by ABC is much smaller and reflects a real cost through a proper distribution of costs of activities per end product (coal).

Table 4. Production cost calculated by the classic (traditional) method

Explanations			Sum (RON)
Direct costs	Costs on raw materials	01	861278.00
	Costs on electricity and water	02	113365.57
	Depreciation and amortization	03	733.000.00
	Costs on inventory items, packages	04	540.631.49
	Costs on material transport	05	38146.85
	Salaries	06	2290308.00
	Salary enhancements	07	1124838.00
Total direct costs (01+07)		*08*	*5701567.91*
Additional costs	Costs on miscellaneous	09	23049.26
	Costs on electricity and water	10	744180.00
	Costs on water	11	29060.00
	Depreciation and amortization	12	29060.00
	Salaries	13	952500.00
	Salary enhancements	14	267655.00
Total additional costs (09+14)		*15*	*2045504.26*
Production overheads	Costs on miscellaneous	16	3874.00
	Costs on electricity and water	17	195224.00
	Costs on water	18	47729.00
	Depreciation and amortization	19	405.00
	Salaries	20	1233000.00
	Salary enhancements	21	614231.00
Total production overheads (16+21)		*22*	*2094463.00*
Administrative overheads	Depreciation of fixed interest	23	543867.80
	Maintenance and management costs, depreciation of fixed interest	24	736241.73
	Costs on maintenance material, cleaning buildings	25	3621.99
	Electricity costs for lighting and motive power	26	790940.64
Total administration overheads (23+26)		*27*	*2074672.16*
Total overheads (15+22+27)		*28*	*6214639.42*
Total production cost (08+28)		*29*	*11916207.33*

According to the classical methods of calculation of production costs, the cost is calculated as follows:

$$PC = DC + AC + PO + AO \quad (2)$$

Where:
CD = Direct costs;
AC = Auxiliary costs;
PO = Production overhead;
AO = Administrative overhead.

The unit cost of the annual production of coal is:

$$PC/tone = \frac{11{,}916{,}207.33}{44{,}603} = 267.16 \text{ RON/tone}$$

Traditional methods were using, for the allocation of indirect costs, few arbitrary allocation keys, which has led to a decrease in the reliability of their expenditure, giving rise to much too large expenditure for some products and too small expenditure for others. In order to expand the services offered to the customers and to be competitive at the same time, many extractive mining industry entities, use a tile on cost centers. The lack of identification of the production centers that were consuming the entity's resources in a heterogeneous manner, did not allow the manager to charge the actual cost of each cost center. This is an improvement of the informative system by ABC method approach that enables the manager to react rapidly to opt for revision of sales prices, before launching production into a production centre. Thus, in the case of responding to certain orders, the Administrative Department may be much more important for a certain strategic segment than for another. An analysis of the expenditure on activities carried out in a production center, allows defining a far more accurate way of determining and allocating, and also obtains the same return in each cost center.

In order to adapt themselves to the customers' demands, mining extractive industry entities are tempted to differentiate commercial arrangements depending on certain specific purposes. In other words, an entity shall be market competitive, depending on its purpose. Under these circumstances, the commercial department of that entity can cover larger or smaller segments of customers. The commercial costs to approach these two categories of customers are very different and are reflected in the costing and pricing offer benefits. These arguments militate in favor of waiving the indirect costs associated with the transportation service according to the turnover, which is an arbitrary criterion, widely used in the calculation of the cost of traditional methods. The result of the two segments of customers relies on the imposition of a share of the transport costs. In the case of traditional methods, this imposition has no relation to the actual consumption of services, because it uses an arbitrary criterion in their breakdown.

In contradiction, the ABC method results in a fairer allocation criterion, whereas the allocation criterion used is well chosen and also takes into account the identification of clients as accurately as possible. The ABC method allows the analysis of the impact of the activities on the actual profitability, according to a specific purpose, and very precise identification of costs, the effects of the activities of new products and their allocation per customers.

As already known, the cost of production is the starting point in setting sales prices. However, numerous entities calculate a sales price determined on the basis of cost accumulation, derived from increases in wages, cost of materials or on the basis of a coefficient or multiplier applied to them and which are determined per type of benefit, product or customer. For example, carrying out repairs to machinery was ensured, under traditional methods,

by specialized firms or by persons specifically trained in repairing machinery, while, in the case of the method ABC (Activity Based Costing), these repairs are carried out by workers who work and ensure maintenance of the equipment, hence the emergence of the concept of poli-qualified workers (workers trained to fulfill a number of extended tasks.)

The approach proposed by the method ABC (Activity Based Costing) constitutes the means to reconfigure the sales price and the fixing solution to improve the profitability of computing traditional costs. The ABC method enables new operations, either at the level of a method by which it "sells" the production costs, or it sells services for which the selling price is displayed and transparent, and/or the risk of collapse of the cost of the service is no longer supported by the customer but by the provider. This new method for determining the selling price has been conceived by taking into account two directions: the identification of customer benefits and low production cost calculation based on activities.

4 Conclusions

From the analogy between the traditional methods of calculation of production costs and the ABC method (Activity Based Costing), we can distinguish clearly the latter's contribution in additional information. One of the most important contributions of the ABC method is that it remedies the weaknesses of traditional approaches to calculate the production costs and thus it is the guarantor of obtaining actual costs in the mining extractive industry entities in Romania. Currently in most Romanian entities, including the mining sector, there is an increase in unproductive activities (non-market) and the ABC method enables the allocation of most indirect costs per products manufactured, works performed or services provided. The ABC method focuses on the actual behavior of costs, helping in this way to identifying the non-value activities. It uses multiple cost drivers which emphasize the direct cause-and-effect relation between the expenses to allocate and the allocation bases used.

We hope that what we have presented and substantiated in this article shall constitute a starting point for professionals and entities in understanding and correctly applying the principles of the ABC method. In addition, the advantages of this method are a vital asset to make specialists think of a more efficient management, taking into account the possibilities for determining the real costs, particularly under the present circumstances of the business environment while competition is becoming increasingly acerbic.

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